

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Matter of the Application of: H. Herrmann, et al.
For: **Improved Contact for Error Resistant Coupling of Electrical Signals**

Serial No.: Unknown Filed: August 8, 2001
Examiner: Unknown Group Art Unit: Unknown

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, DC 20231

EXPRESS MAIL CERTIFICATION UNDER 37 CFR §1.10

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR §1.10 on the date indicated below and is addressed to the Commissioner for Patents, Washington, DC 20231.

Express Mail mailing label n°EK803528306US Date of Deposit August 08, 2001

Typed/printed name Kathy McGee

Signature

Kathy McGee

Sir:

Please amend, without prejudice, the application as follows:

IN THE SPECIFICATION:

Delete the paragraph beginning at page 4, line 24.

Substitute the following paragraph for the paragraph beginning at page 4, line 27: Figure 4a is an alternative embodiment of the present invention with a tapered high resistive portion.

Substitute the following paragraph for the paragraph beginning at page 4, line 29: Figure 4b is an alternative embodiment of the instant invention with a stepwise-tapered high resistive portion.

Substitute the following paragraph for the paragraph beginning at page 5, line 1: Figure 4c is an alternative embodiment of the present invention with a resistive portion of mixed high resistive materials.

Substitute the following paragraph for the paragraph beginning at page 5, line 4: Figure 4d is an alternative embodiment of the present invention with a conductive barb in the high resistive portion.

Substitute the following paragraph for the paragraph beginning at page 5, line 7: Figure 4e is an alternative embodiment of the present invention with the high resistive portion extending into a hole in the conductive portion.

Substitute the following paragraph for the paragraph beginning at page 5, line 10: Figure 4f is an alternative embodiment of the present invention with a high resistive housing.

Substitute the following paragraph for the paragraph beginning at page 5, line 12: Figure 4g is an alternative embodiment of the present invention with a high resistive inset in the housing.

Substitute the following paragraph for the paragraph beginning at page 5, line 15: Figures 4h and 4i are an alternative embodiment of the present invention with a high resistance inset in the housing.

Substitute the following paragraph for the paragraph beginning at page 5, line 18: Figure 5 is an illustration of the instant invention utilized on a circuit board.

Substitute the following paragraph for the paragraph beginning at page 5, line 20: Figure 6 is an illustration of the instant invention being used on a cylindrical connector.

Substitute the following paragraph for the paragraph beginning at page 5, line 22: **Figure 7** is an illustration of the various prior art connectors.

Substitute the following paragraph for the paragraph beginning at page 5, line 28: Referring to **Figure 1**, the preferred embodiment of the connector assembly of the present invention comprises a plug **6** for mating with a corresponding receptacle **8**. It should be recognized that although only one plug contact **7** is shown in detail for simplicity, there are typically at least two or more plug contacts **7** within every plug **6** for mating with corresponding receptacle contacts **15**. The shape of the plug **6** is not central to the present invention. For simplicity, the plug **6** and plug contact **7** are illustrated as rectangular, although those of skill in the art will realize that many other shapes could be used without departing from the spirit of the present invention. The plug contact **7** comprises a conductive portion **14** which can be made from any conductive material, (such as brass, nickel, gold, copper or a superconductor, etc.) and a highly resistive portion **12**. The resistive portion **12** is generally rectangular shaped and extends across the width **W** of the plug contact **7**. The resistive portion **12** comprises a layer of highly resistive material inset into the surface **16** of the plug contact **7**, with a first end **11** of the resistive portion **12** exposed to the receptacle **8** and a second end **13** of the resistive portion **12** in contact with the conductive portion **14**.

Substitute the following paragraph for the paragraph beginning at page 6, line 26: In operation, the first end of the plug **6** is inserted into the cavity of the receptacle **8**. The receptacle contact **15** will make first contact with the resistive portion **12**. Since it is contemplated that the electronic system will be energized, this will permit energy from the electronic system to begin flowing from the receptacle contact **15**, through the resistive portion **12** and into the conductive portion **14** of the plug contact **7**. The

resistive portion **12** reduces the magnitude of voltage pulses such that they will not present errors into the electronic system, as will be explained in detail hereinafter. A portion of the voltage "seen" by the plug **6** will drop across the resistive portion **12**. As the plug **6** is inserted further into the receptacle **8**, the receptacle contact **15** passes along the surface **16** of the resistive portion **12** until it finally reaches the conductive portion **14** of the plug contact **7**. When the plug **6** is fully inserted into the receptacle **8**, the receptacle contact **15** will be in direct contact with the conductive portion **14** of the plug contact **7**. Accordingly, there will be no voltage drop across the resistive portion **12** of the plug contact **7**. With respect to capacitance, the arrangement of the present invention specifically limits the capacitance between the metallic portions of the plug and receptacle contacts **7**, **15**, (it bypasses the high resistance), to an acceptably low level. It does this by minimizing their effective coupling area and the effective dielectric constant between them, which is primarily air.

Substitute the following paragraph for the paragraph beginning at page 8, line 28: Figure 3 is a graph of the electrical resistance as measured from the end of the plug contact **7**. This graph is based on a resistive portion **12** of a rectangular shape 15 mils wide and 15 mils long. All other parameters were held constant. As shown, the resistance increases as the thickness of the resistive portion **12** increases. Referring to curve **20**, when a resistive portion thickness of 8 mils is used, a resistance of 10 MW is achieved at the first end **11** of the plug contact **7**, which gradually decreases until the second end **13** is reached where the resistance is nominally zero.

Delete the paragraph beginning at page 9, line 10.

Substitute the following paragraph for the paragraph beginning at page 9, line 20: By changing both the resistivity and the geometry of the resistive portion **12**, as those skilled in the art will realize, the present invention can be adapted to different uses and applications. However, it is

also extremely important to reduce the short capacitance to a negligible level. The short capacitance is reduced by keeping the thickness of the inlay **12** relatively thick, (i.e. in applying the present invention to a SCSI Bus, typically approximately 5 mils). By adjusting the resistivity and thickness of the resistive portion, connector assemblies can be created with desirable characteristics by preventing voltage surges for various types of signals and applications.

Substitute the following paragraph for the paragraph beginning at page 10, line 1:

Alternative embodiments of the present invention are shown in **Figures 4a-4i**. In the embodiment depicted in **Figure 4a**, the resistive portion **12** has a tapered profile. By varying the shape of the tapered profile of the resistive portion, the resistive transition curves that result as the receptacle contact **15** passes over the resistive portion **12** can be varied as desired for a particular application.

Substitute the following paragraph for the paragraph beginning at page 10, line 9:

Figure 4b depicts an alternative embodiment with the resistive portion **12** in a stepwise-tapered profile **17**. By varying the steps between the steps, the resistive transition curves can be varied as desired.

Substitute the following paragraph for the paragraph beginning at page 10, line 13:

A third alternative embodiment is shown in **Figure 4c**. The resistive portion **12** consists of two or more materials with varying resistivities.

Substitute the following paragraph for the paragraph beginning at page 10, line 16:

Figure 4d, a fourth alternative embodiment shows, the resistive portion **12** extending from the conducting portion **14**. A conducting barb **18** extends from the conducting body **14** into the resistive portion **12**. A fifth alternative embodiment, **Figure 4e**, has the resistive portion **12** extending into a hole **19** in the conducting portion **14**. As those skilled in the

art will note many other variations are possible without departing from the spirit of the invention. These varying embodiments can be used for varying the resistive transition curves for differing applications.

Substitute the following paragraph for the paragraph beginning at page 10, line 27: Figure 4f depicts a sixth embodiment. The conductive body **14** is surrounded by a high resistive housing **30**. Receptacle contact **15** first makes contact with high resistive housing **30**. As the receptacle contact **15** makes contact with conducting portion **14**, the receptacle contact sees essentially no resistance.

Substitute the following paragraph for the paragraph beginning at page 11, line 1: In Figure 4g, the housing **30** is non-conductive. However, high resistive portions **12** make initial contact with receptacle contact **15**. The high resistive portions **12** are electrically connected and may be physically connected (not shown) to conducting portion **14**.

Substitute the following paragraph for the paragraph beginning at page 11, line 6: Figures 4h and 4i depict a plug contact **7** having a housing **85** surrounding a first high resistance **31** portion and a second low resistance portion **32**. Upon full mating, the receptacle contact **15** is in full contact with the low resistance portion **32**.

Substitute the following paragraph for the paragraph beginning at page 11, line 11: Figure 7 illustrates that the present instant invention may also be used with the contacts on a printed circuit board. The resistive portions **70a-70n** of the instant invention may be employed in one or more plug contacts **72a-72n** on a conventional printed circuit board **71**. **Figure 6** shows that the present invention may be adapted to various shaped applications. For instance, a plug **83** with a cylindrical shape with a resistive portion **81** and conductive portion **82**. Receptacle contacts **84** within the

receptacle **85** make contact with the resistive portion **81** prior to the conductive portion **82**.

Substitute the following paragraph for the paragraph beginning at page 11, line 23: Figure 7 illustrates some prior art electrical connectors. The size and shape of the connectors vary. As those skilled in the art will realize, the present invention can be used with the contacts within these various connectors.

In the Abstract:

Substitute the following paragraph for the paragraph beginning at page 18, line 2: A signal connector assembly with a plug contact within a plug having a high resistive portion. When the plug of the assembly first makes contact with the electrical receptacles within a mating receptacle, the high resistive portion prevents a current surge. As the plug is further inserted into the receptacle, the energy passing from the plug to the receptacle is gradually increased. Eventually, the receptacle contacts within the receptacle pass the high resistive portion and make contact with the conductive portion of the plug contact, thereby permitting transmission of valid signals without the generation of spurious errors.

In the Drawings:

Subject to the approval of the Examiner, please replace existing drawings, Figures 1-4, 5-8, with the enclosed drawings, Figures 1-3, 4-7, wherein the original Figure 4 is removed and Figures 5-8 are marked in red to indicate Figures 4-7 respectively.

In the Claims:

Delete claims 1 - 26.

Add claims 27 and 28 as follows:

27. An electrical contact comprising:

a conductive portion of a material having a first resistivity; and

a resistive portion of a material having a second resistivity that is significantly greater than the first resistivity, the resistive portion exposed for direct engagement with a mating contact and in direct contact with the conductive portion to allow current flow along a shortest path between the mating contact and the conductive portion.

28. A connector assembly comprising:

a first contact and a second contact configured to mate with the first contact;

the first contact configured for slidably engaging the second contact to continuously define an electric signal connection between the first contact and the second contact and comprising conductive material and a resistive material exposed for direct, initial engagement with the second contact to produce an initial high resistance connection along a shortest path between the second contact and the conductive material.

REMARKS

The application has been amended to correct various typographical errors. Subject to the approval of the Examiner, it is requested that the existing drawings Figures 1-4, 5-8 be replaced with the enclosed drawings Figures 1-3, 4-7; wherein the original Figure 4 is removed and Figures 5-8 are marked in red to indicate Figures 4-7 respectively.

Figure 4 is related to resistivity and some of the values shown therein have been determined, after the original filing, to be now incorrect and further investigation may reveal further inaccuracies regarding resistivity. The retainment of Figure 4 may be more misleading than helpful. Further, the need to describe resistivity is not necessary because it is the resistance of claimed contact that is important and this resistance is correctly described and recited.

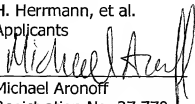
The removal of Figure 4 necessitated changing Figures 5-8 along with changes in the specification. Also included are changes to correct for minor errors.

If the examiner has any questions regarding the presently pending claims which could be easily resolved by a telephone conference, the examiner is respectfully requested to contact the Applicants' representative at the below listed number.

Respectfully submitted,

H. Hermann, et al.
Applicants

By:


Michael Aronoff
Registration No. 37,770
Attorney for Applicants
Phone: (650) 361-5979
Facsimile: (650) 361-5623

Version With Markings To Show Changes Made

Delete the paragraph beginning at page 4, line 24.

Substitute the following paragraph for the paragraph beginning at page 4, line 27: Figure 4[5]a is an alternative embodiment of the present invention with a tapered high resistive portion.

Substitute the following paragraph for the paragraph beginning at page 4, line 29: Figure 4[5]b is an alternative embodiment of the instant invention with a stepwise-tapered high resistive portion.

Substitute the following paragraph for the paragraph beginning at page 5, line 1: Figure 4[5]c is an alternative embodiment of the present invention with a resistive portion of mixed high resistive materials.

Substitute the following paragraph for the paragraph beginning at page 5, line 4: Figure 4[5]d is an alternative embodiment of the present invention with a conductive barb in the high resistive portion.

Substitute the following paragraph for the paragraph beginning at page 5, line 7: Figure 4[5]e is an alternative embodiment of the present invention with the high resistive portion extending into a hole in the conductive portion.

Substitute the following paragraph for the paragraph beginning at page 5, line 10: Figure 4[5]f is an alternative embodiment of the present invention with a high resistive housing.

Substitute the following paragraph for the paragraph beginning at page 5, line 12: Figure 4[5]g is an alternative embodiment of the present invention with a high resistive inset in the housing.

Substitute the following paragraph for the paragraph beginning at page 5, line 15: Figures 4[5]h and 4[5]i are an alternative embodiment of the present invention with a high resistance inset in the housing.

Substitute the following paragraph for the paragraph beginning at page 5, line 18: Figure 5[6] is an illustration of the instant invention utilized on a circuit board.

Substitute the following paragraph for the paragraph beginning at page 5, line 20: Figure 6[7] is an illustration of the instant invention being used on a cylindrical connector.

Substitute the following paragraph for the paragraph beginning at page 5, line 22: Figure 7[8] is an illustration of the various prior art connectors.

Substitute the following paragraph for the paragraph beginning at page 5, line 28: Referring to Figure 1, the preferred embodiment of the connector assembly of the present invention comprises a plug 6 for mating with a corresponding receptacle 8. It should be recognized that although only one plug contact 7 is shown in detail for simplicity, there are typically at least two or more plug contacts 7 within every plug 6 for mating with corresponding receptacle contacts 15. The shape of the plug 6 is not central to the present invention. For simplicity, the plug 6 and plug contact 7 are illustrated as rectangular, although those of skill in the art will realize that many other shapes could be used without departing from the spirit of the present invention. The plug contact 7 comprises a conductive portion 14 which can be made from any conductive material, (such as brass, nickel, gold, copper or a superconductor, etc.) and a highly resistive portion 12. The resistive portion 12 is generally rectangular shaped and extends across the width W of the plug contact 7. The resistive portion 12 comprises a layer of

highly resistive material inset into the surface **16** of the plug contact 7 **[6]**, with a first end **11** of the resistive portion **12** exposed to the receptacle **8** and a second end **13** of the resistive portion **12** in contact with the conductive portion **14**.

Substitute the following paragraph for the paragraph beginning at page 6, line 26:

In operation, the first end of the plug **6** is inserted into the cavity of the receptacle **8**. The receptacle contact **15** will make first contact with the resistive portion **12**. Since it is contemplated that the electronic system will be energized, this will permit energy from the electronic system to begin flowing from the receptacle contact **15**, through the resistive portion **12** and into the conductive portion **14** of the plug contact **7**. The resistive portion **12** reduces the magnitude of voltage pulses such that they will not present errors into the electronic system, as will be explained in detail hereinafter. A portion of the voltage "seen" by the plug **6** will drop across the resistive portion **12**. As the plug **6** is inserted further into the receptacle **8**, the receptacle contact **15** passes along the surface **16** of the resistive portion **12** until it finally reaches the conductive portion **14** of the plug contact **7**. When the plug **6** is fully inserted into the receptacle **8**, the receptacle contact **15** will be in direct contact with the conductive portion **14** of the plug contact **7**. Accordingly, there will be no voltage drop across the resistive portion **12** of the plug contact **7**. With respect to capacitance, the arrangement of the present invention specifically limits the capacitance between the metallic portions of the plug and receptacle contacts **7, 15**, (it bypasses the high resistance), to an acceptably low level. It does this by minimizing their effective coupling area and the effective dielectric constant between them, which is primarily air.

Substitute the following paragraph for the paragraph beginning at

page 8, line 28: **Figure 3** is a graph of the electrical resistance as measured from the end of the plug contact **7**. This graph is based on a resistive portion **12** of a rectangular shape 15**[13]** mils wide and 15 mils long.

All other parameters were held constant.[The high resistive material had a resistivity of 9×10^{10} ohm-inches.] As shown, the resistance increases as the thickness of the resistive portion **12** increases. Referring to curve **20**, when a resistive portion thickness of 8 mils is used, a resistance of 10 MW is achieved at the first end **11** of the plug contact **7**, which gradually decreases until the second end **13** is reached where the resistance is nominally zero. Curves **21**, **22** and **23** illustrate that the resistance decreases with a decrease in resistive portion thickness. The shape of the curves also differs as the resistive portion thickness is changed.

Delete the paragraph beginning at page 9, line 10.

Substitute the following paragraph for the paragraph beginning at page 9, line 20: By changing both the resistivity and the geometry [thickness] of the resistive portion **12**, as those skilled in the art will realize, the present invention can be adapted to different uses and applications. However, it is also extremely important to reduce the short capacitance to a negligible level. The short capacitance is reduced by keeping the thickness of the inlay **12** relatively thick, (i.e. in applying the present invention to a SCSI Bus, typically approximately 5 mils). By adjusting the resistivity and thickness of the resistive portion, connector assemblies can be created with desirable characteristics by preventing voltage surges for various types of signals and applications.

Substitute the following paragraph for the paragraph beginning at page 10, line 1: Alternative embodiments of the present invention are shown in **Figures 4[5]a-4i[5h]**. In the embodiment depicted in **Figure 4[5]a**, the resistive portion **12** has a tapered profile. By varying the shape of the tapered profile of the resistive portion [**13**], the resistive transition curves that result as the receptacle contact **15** passes over the resistive portion **12** can be varied as desired for a particular application.

Substitute the following paragraph for the paragraph beginning at page 10, line 9: **Figure 4[5]b** depicts an alternative embodiment with the resistive portion **12** in a stepwise-tapered profile **17**. By varying the steps between the steps, the resistive transition curves can be varied as desired.

Substitute the following paragraph for the paragraph beginning at page 10, line 13: A third alternative embodiment is shown in **Figure 4[5]c**. The resistive portion **12** consists of two or more materials with varying resistivities.

Substitute the following paragraph for the paragraph beginning at page 10, line 16: **Figure 4[5]d**, a fourth alternative embodiment shows, the resistive portion **12** extending from the conducting portion **14**. A conducting barb **18** extends from the conducting body **14** into the resistive portion **12**. A fifth alternative embodiment, **Figure 4[5]e**, has the resistive portion **12** extending into a hole **19** in the conducting portion **14**. As those skilled in the art will note many other variations are possible without departing from the spirit of the invention. These varying embodiments can be used for varying the resistive transition curves for differing applications.

Substitute the following paragraph for the paragraph beginning at page 10, line 27: **Figure 4[5]f** depicts a sixth embodiment. The conductive body **14** is surrounded by a high resistive housing **30**. Receptacle contact **15** first makes contact with high resistive housing **30**. As the receptacle contact **15** makes contact with conducting portion **14**, the receptacle contact sees essentially no resistance.

Substitute the following paragraph for the paragraph beginning at page 11, line 1: In **Figure 4[5]g**, the housing **30** is non-conductive. However, high resistive portions **12** make initial contact with receptacle

contact 15. The high resistive portions **12** are electrically connected and may be physically connected (not shown) to conducting portion **14**.

Substitute the following paragraph for the paragraph beginning at page 11, line 6: Figures **4[5]h** and **4[5]i** depict a plug contact 7 having a housing 85 surrounding a first high resistance **31** portion and a second low resistance portion **32**. Upon full mating, the receptacle contact **15** is in full contact with the low resistance portion **32**.

Substitute the following paragraph for the paragraph beginning at page 11, line 11: Figure **7[6]** illustrates that the present instant invention may also be used with the contacts on a printed circuit board. The resistive portions **70a-70n[A-N]** of the instant invention may be employed in one or more plug contacts **72a-72n[A-N]** on a conventional printed circuit board **71**. Figure **6[7]** shows that the present invention may be adapted to various shaped applications. For instance, a plug **83** with a cylindrical shape with a resistive portion **81** and conductive portion **82**. Receptacle contacts **84** within the receptacle **85** make contact with the resistive portion **81** prior to the conductive portion **82**.

Substitute the following paragraph for the paragraph beginning at page 11, line 23: Figure **7[8]** illustrates some prior art electrical connectors. The size and shape of the connectors vary. As those skilled in the art will realize, the present invention can be used with the contacts within these various connectors.

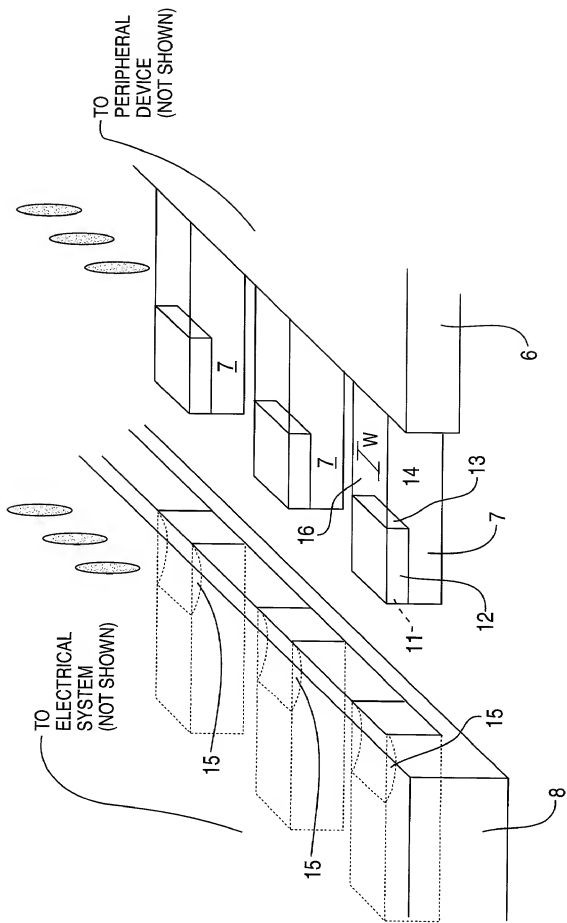
Substitute the following paragraph for the paragraph beginning at page 18, line 2: A signal connector assembly with a plug contact within a plug having a high resistive portion. When the plug of the assembly first makes contact with the electrical receptacles within a mating receptacle, the high resistive portion prevents a current [voltage] surge. As the plug is further inserted into the receptacle, the energy passing from the plug to the

receptacle is gradually increased. Eventually, the receptacle contacts within the receptacle pass the high resistive portion and make contact with the conductive portion of the plug contact, thereby permitting transmission of valid signals without the generation of spurious errors.

Claims 1 - 26 have been deleted.

Claims 27 and 28 have been added.

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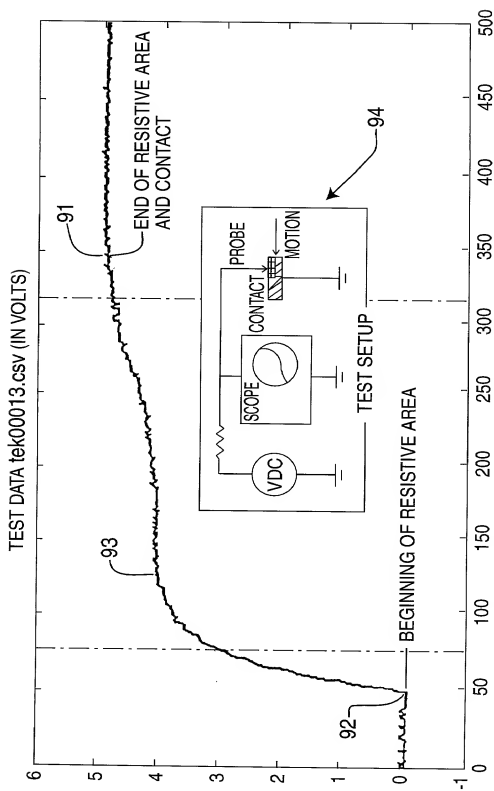


FIG. 2

MEGAOHMS vs. DISTANCE FROM END
INLAY Rho = $9E10$ OHM-INCHES

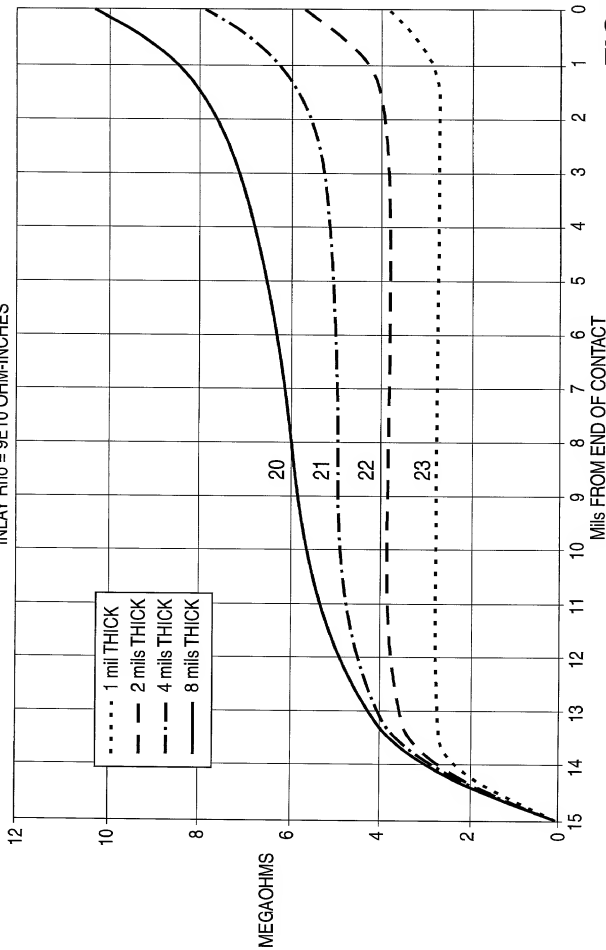


FIG. 3

ELECTROMAGNETIC TECHNOLOGY

[HH] Const_Rho Chart 2 Const_Rho Chart 2



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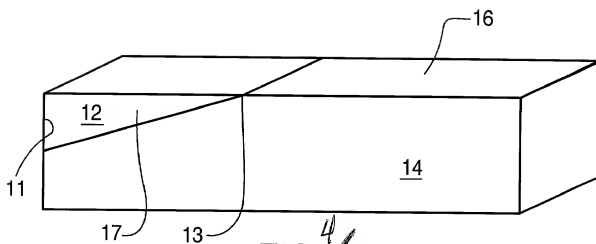


FIG. 5a

FIG. 5a is a perspective view of a rectangular block 16 divided into two sections 12 and 14 by a vertical line 13. A diagonal line 11 is shown on the left face of section 12, and a horizontal line 17 is shown on the bottom edge of section 12.

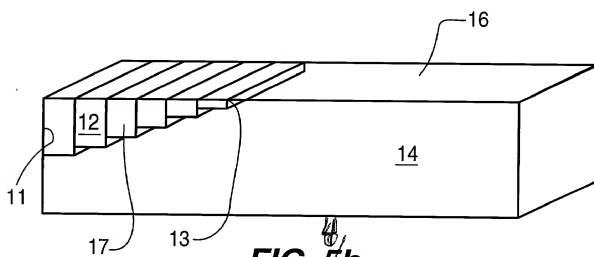


FIG. 5b

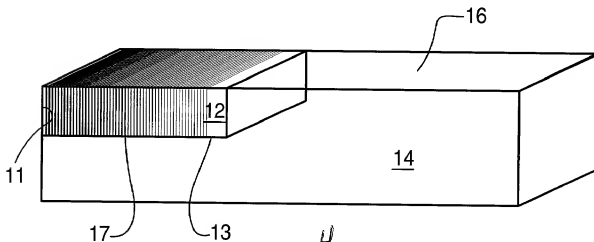


FIG. 5c



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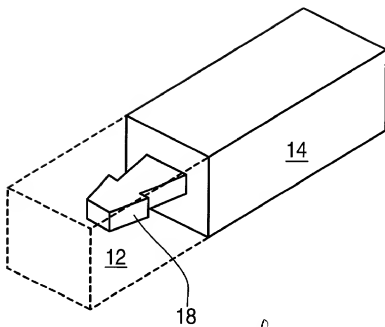


FIG. 5d

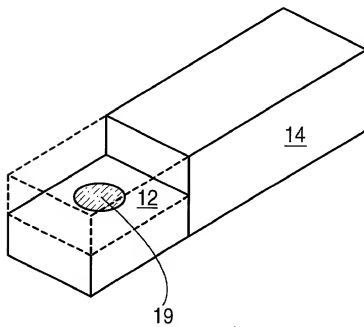


FIG. 5e

FIG. 5f

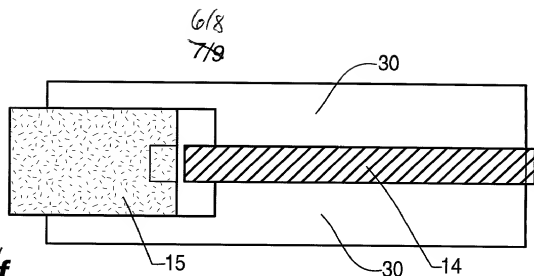
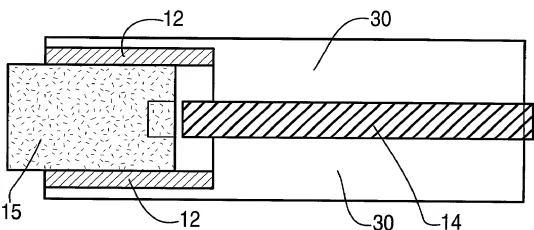
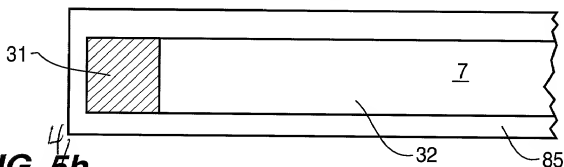


FIG. 5g



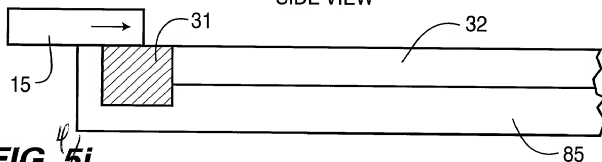
TOP VIEW

FIG. 5h



SIDE VIEW

FIG. 5i



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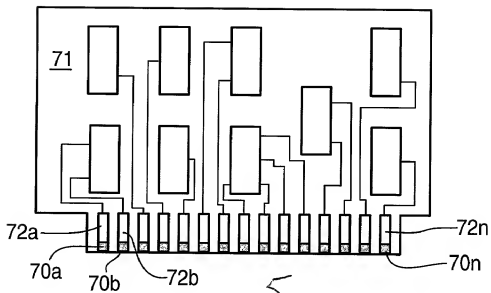


FIG. 6

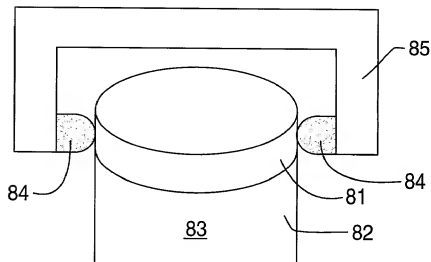
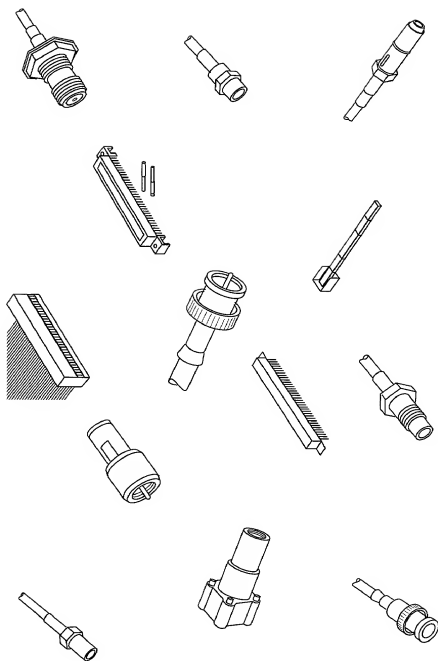


FIG. 7

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7
FIG. 8